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An outline of a conference paper on planning for science facilities provides a reference list of areas and procedures to be considered. The major categories include--(1) the planning stage, (2) the planning committee, (3) the philosophy of science education, (4) the type of facility to be built, (5) facilities and spaces required, (6) information to be obtained from other colleges, and (7) published sources of information. Subgrouping of considerations are included within each major category. Special emphasis is placed on space requirements and relationships. Appendices include the relationship of science to other campus facilities, relationships of spaces, and flow of material in a chemistry department. (MM)

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MASTER PLANNING SCIENCE FACILITIES

An outline of a Paper Presented to the Workshops for Planning Library and Science Facilities for California Junior Colleges Sponsored by the California Junior College Association Facilities Planning Committee and the Bureau of School Planning, California State Department of Education.

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I. THE PLANNING STAGE FOR JUNIOR COLLEGE SCIENCE FACILITIES

A. Pre-Programming Phase (Basic considerations)

1. Science Building Planning Committee
2. Philosophy of Education in the Sciences
3. Types of Science Facilities

B. Programming Phase (Collecting information and organizing requirements)

1. Types of spaces required
2. Number of spaces required
3. Size of spaces required
4. Relationships required among spaces

C. Designing Phase (Communicating with the administration and the architect)

1. Functional relationship analysis
2. Scale drawing of spaces
3. Complete room descriptions

D. Sources of Information

1. Visits to other colleges
2. Books
3. Periodical Literature
4. Consultants

II. WHAT IS A SCIENCE BUILDING PLANNING COMMITTEE?

A. The committee should include

1. One representative from each "science department" faculty concerned with the new facilities;

2. The division chairman or person(s) immediately responsible for the administration of the science department(s) included;

3. The campus building coordinator or planning director;

4. One representative from the buildings and grounds department; and

5. The director of instruction as an ex-officio member.

B. Important considerations are

1. Appointment of committee by president;

2. Committee given authority and responsibility for planning building(s) with respect to

   a. collecting requirements for facilities;
   b. communicating requirements to administration and architect, and
   c. overseeing incorporation in the design and construction of the building;

3. Appointment of members who have sufficient standing in the organization to command the respect of the other members and those from whom information will be gathered;

4. Appointment as chairman of the scientist member best able to represent the broad view in regard to questions of suitability, economy, esthetics, and amenities;

5. Relief of some of chairman's other duties so he might devote the necessary time and energy to the committee work; and

6. Adoption of a resonable time schedule for the programming phase.

III. WHAT IS THE PHILOSOPHY OF EDUCATION IN THE SCIENCES OF YOUR COLLEGE?

A. Fundamental questions

1. What are the objectives of the educational program in the sciences?

2. What should be the way of implementing these objectives?

3. How do these objectives differ from those of other colleges?

4. How does this way of implementation differ from those of other colleges?

5. What limitations have the present science facilities placed on realizing these objectives and in properly developing the desired way of implementing these objectives?

B. Contributions of a philosophy of education in the sciences to the planning of new science facilities are

1. Value derived from a self study;

2. Facilities planned on a firm educational foundation accepted by faculty and administration as a guide for the planning;

3. Basis for resolving individual differences arising during planning;

4. Fountainhead of questions for analyzing why other colleges planned their way and evaluating practices and plans in terms of usefulness to own institution; and

5. Organized, well thought out, consistent frame of reference for administration, SBPC, and faculty to use in explaining the plans to the board, architect, other colleges, foundations, citizens, etc.

C. Considerations in the development of a philosophy of education in the sciences are

1. Philosophy of education of the college;

2. Purposes of the college;

3. Objectives of instruction in the sciences in general and in each science in particular;

4. Methods of instruction to fulfill objectives, purposes, and philosophy;

5. Desired quality of instruction and level of success of students upon leaving the college; and

6. Necessary faculty and assistance (administrative, technical, and clerical) to accomplish 1 through 5 above.

IV. WHAT TYPE OF FACILITY SHOULD BE BUILT?

A. Types of science facilities are

1. Separate science buildings;
2. Science wing(s) in a larger building; and
3. A Science Center

B. Questions to be answered before selecting the type of facility are

1. What is the estimated saturation date (ESD) desired for the new facility?

2. What is the anticipated college enrollment at the ESD?

3. What is the estimated percentage of the college enrollment which will be enrolled in science courses at the ESD?

4. What is the estimated size of the science faculty at the ESD?

5. What courses and curricula involving science courses will be included in the curriculum of the college at the ESD?

6. What will be the administrative organization of the science area of the college at the ESD?

7. How much non-certificated technical assistance will the administration be willing to provide to the science department(s) at the ESD?

V. WHAT FACILITIES OR SPACES ARE REQUIRED IN COLLEGE SCIENCE BUILDINGS?

A. Functional Categories

1. Direct instructional (teaching stations)	lecture halls, classrooms, lecture-laboratory rooms, laboratories
2. Auxiliary instructional	balance rooms, instrument rooms, special project rooms, optical dark rooms
3. Instructional service (technical assistant work areas)	supply rooms, stock rooms, shops, laboratory preparation rooms, lecture preparation rooms, projection rooms
4. Faculty (faculty work areas)	faculty offices, faculty preparation rooms
5. Administrative (administration and clerical work areas)	division or department chairman's office, secretary's office, work room, conference room
6. Building service (operation and maintenance areas)	mechanical and electrical service rooms, custodians rooms, restrooms
7. Corridors	student internal, staff internal, external

VI. WHAT TYPES OF SPACES AND HOW MANY OF EACH TYPE ARE REQUIRED IN A GIVEN BUILDING?

A. What course offerings are projected at the estimated saturation date?

The curriculum projection requires a review and analysis of

1. Present curriculum of the junior college;
2. Present and projected curriculum of the major transfer colleges and professional schools for the junior college;
3. Curriculum needs of the local area for the various technologies; and
4. Changes in the pattern of education in the sciences for students majoring in the various sciences, engineering, health professions, technologies, etc.

B. What types of spaces are required for the above projected curriculum?

1. Lecture rooms and/or class rooms;
2. Laboratories and/or lecture-laboratories; and
3. Balance rooms, instrument rooms, special project rooms, etc.?

C. What is the estimated enrollment in each of the courses at the time of saturation?

The enrollment projection requires a review and analysis of the last five years experience for

1. Total enrollment for each science department concerned;
2. Enrollment by courses;
3. Total enrollment in non-science major courses in science;
4. Total college enrollment, full-time, part-time, and a.d.a.;
5. Total enrollment in each major requiring a science course;
6. Percentage of graduates of the local high schools entering; and
7. Percentage of students coming from high schools outside district.

D. The five year figures should be projected to the saturation date with consideration given to

1. Establishment of new colleges in the area;
2. Establishment of new curricula requiring science courses;
3. Establishment of new courses within the sciences;
4. Change in requirements of transfer schools or of technology major advisory committees; and
5. The rate of change of the increase in the various enrollments.

E. How many of each type of instructional facility will be required?

The determination of the number of each type of space depends on the answers to college policy questions such as:

1. Size of laboratory sections for each course;
2. Size of lecture sections for each course;
3. Scheduling of lecture and laboratory sections during day and evening;
4. Addition of extra students at the start of the semester;
5. Desired percentage utilization and reference basis for both lecture and laboratory types of rooms;
6. Assignments of pre-laboratory discussion periods and quiz sections;
7. Minimum number of students required to hold each course; and
8. Concurrent scheduling of laboratory sections.

F. The number of each type of space is determined by

1. Applying answers to above policies to determine the projected number of sections of each course at the estimated saturation;
2. Determining number of rooms required to handle the above number of sections; and
3. Preparing a schedule to show how these courses and sections would be scheduled in these rooms.

G. What instructional service spaces will be required to serve these instructional facilities?

The service functions required to service the projected curriculum must be identified. A classification of these functions might be

1. Preparation,
2. Dispensing or setting up,
3. Storage,
4. Construction and repair,
5. Receiving, and
6. Other.

H. A determination of who is expected to perform each of these functions is required and this should include an estimate of the time available by

1. Technical assistants;
2. Students, paid or credit; and
3. Faculty.

I. The specific types and numbers of instructional service spaces required may then be determined by analysis of

1. Direct and auxiliary instructional spaces required, type and number of each specific type;
2. Service functions required; and
3. Type and amount of assistance available to perform services.

J. What will be the requirements for faculty spaces?

The determination of the type and number of each type of faculty space depends on the answers to college policy questions such as:

1. Number of faculty members per office;
2. Location of faculty spaces with respect to the other spaces in the building;
3. Provision of faculty laboratory facilities for preparation and special project work which has to be done at the "bench"; and
4. Assignment of evening courses; and
5. Teaching load for the science faculty.

K. What will be the requirements for administrative spaces?

The determination of the type and number of each type of administrative space depends on the answers to college policy questions such as:

1. Administrative organization of the science area at saturation;
2. Location of and facilities for divisional and/or departmental administrators;
3. Secretarial and clerical positions and facilities provided for divisional and/or departmental administrators; and
4. Work room, conference room, library, instructional materials, lounge and social facilities provided for areas.

L. What will be the requirements for building operation and maintenance spaces?

The determination of the type and number of each type of building operation and maintenance space requires consideration of

1. Type of heating, ventilating, and air conditioning systems required and their locations;
2. Type of water treatment, distillation and softening, system required and its location;
3. Rest room requirements, custodial requirements, and special equipment and service requirements.

VII. WHAT INFORMATION IS NECESSARY TO DETERMINE THE SIZE OF A LABORATORY AND ITS RELATIONSHIP TO OTHER SPACES WHEN WORKING FROM THE INSIDE OUT?

A. Student stations

1. Number of student stations required.
2. Table top work area required per student station.
3. Services, cabinets, drawers, seating and other special items required at each student station including the necessary sizes and location at the student station.
4. Desired arrangement of student stations within the room.

B. Instructional center

1. Table top work area required for instructor's table and carts and location of the table and carts, also services required.
2. Location and length of chalkboards, tackboards, and chart hanging devices.
3. Provisions for audio-visual equipment.

C. Instructional services

1. Provisions for dispensing from supply room.
2. Table top work area required for setting out laboratory materials in the room for student usage and locations of such areas.
3. Location, lineal footage, and depth of storage cabinets to be located within the room and type of doors for such.

D. Traffic and aisle requirements and access to other spaces

1. Size of various types of aisles as determined by usage.
2. Desired traffic flow patterns within the room.
3. Provision for student access to outside, auxiliary rooms, and service windows.
4. Provision for faculty access to faculty spaces and service area.
5. Provision for materiel flow from service area.

E. Additional services and functions to be provided along the room perimeter or elsewhere within the room

1. Specialized utilities such as hoods, large sinks, distilled water.
2. Safety equipment and provisions.
3. Specialized equipment provisions.
4. Display and demonstration equipment provisions.

VIII. WHAT INFORMATION ABOUT LECTURE ROOMS AND CLASSROOMS SHOULD BE OBTAINED FROM VISITS TO OTHER COLLEGES?

A. Room size

1. Number of seats, room area and room volume.

B. Room arrangement showing:

1. Arrangement of seating, instructor's table, chalkboards, special equipment, audio-visual items, storage provisions, room openings.

C. Measurements

1. Room dimensions: room width, room depth, ceiling height.
2. Seating arrangement: number of rows, distance between rows, distance from first row to center of lecture table, floor rise per row of seats.
3. Lecture table: length, depth, height.
4. Chalkboard: length of fixed board in front, sides and back of room and length of movable boards.
5. Tackboard: total length provided in room.
6. Student writing surface: dimensions.
7. Screen size: dimensions.

D. Special Features

Describe the special features in this arrangement that merit special mention or require special attention?

1. Seats: type, mounting, writing surface, etc.
2. Lecture table: design, services, storage, controls, etc.
3. Provision for use of carts and size of carts.
4. Provisions for audio-visual techniques: projections, screens, television.
5. Chalkboards and charts.
6. Provisions for mounting lecture-experiment and demonstration equipment.
7. Provisions for room-darkening.
8. Acoustics.
9. Provisions for sound amplification.
10. Seating layout.
11. Aisles
12. Location of openings: doors, windows, corridors.
13. Lighting: room, chalkboard, lecture table.
14. Lobby, coat racks, cloak room, etc.
15. Location with respect to exterior access and campus traffic.
16. Preparation room access.
17. Partitioning of room.
18. Location with respect to laboratories.
19. Provision for closing off from remainder of building.
20. Other features not mentioned above.

IX. WHAT ARE SOME OF THE HELPFUL PUBLISHED SOURCES OF INFORMATION FOR PLANNING SCIENCE FACILITIES?

A. Books

1. J. Sutherland Frame, John W. McLeod, Buildings and Facilities for the Mathematical Sciences. An Educational Facilities Laboratories Report, Conference Board of the Mathematical Sciences, Washington, D.C. 1963.

2. Lewis, Harry F., (ed.), Laboratory Design, Revised ed., National Research Council Report, Reinhold Publishing Corp., New York, 1961.

3. New Spaces for Learning: designing college facilities to utilize instructional aids and media. Troy, N. Y.: Rensselaer Polytechnic Institution, School of Architecture, 1961.

4. Palmer, R. Ronald, and Rice, William M., Modern Physics Buildings: Design and Function, Reinhold Publishing Corporation, New York, 1961.

5. Proceedings of the Wesleyan University Conference on Lecture Demonstrations-- Report of a Conference Sponsored by the American Association of Physics Teachers, June, 1959.

6. Project on Design of Physics Buildings--Selected Reprints of Articles on Physics Buildings, American Institute of Physics, New York, 1959.

7. The College and University Science Center: Report from a workshop sponsored by Educational Executives OVERVIEW Magazine and Perkins & Will, architects, New York City, October 26, 1961.

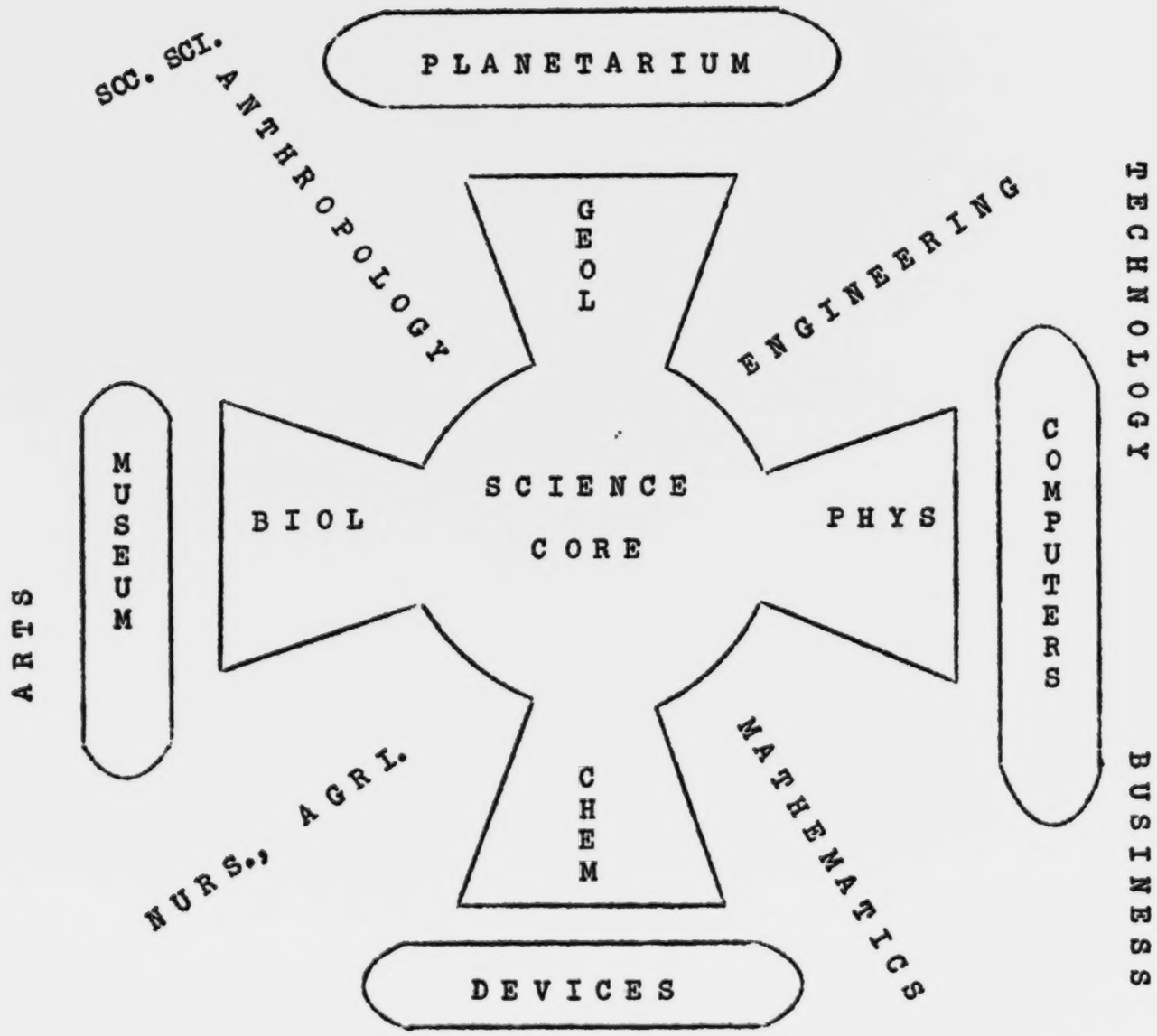
B. Periodicals Designed For

1. Architects	- Architectural Record Progressive Architecture Architect and Engineering Architectural Forum Architectural Review
2. College administrators	- College and University Business American School and University
3. Scientists in higher education	- Journal of Chemical Education American Journal of Physics
4. Laboratory management personnel	- Laboratory Management

Appendix A

THE SCIENCE CENTER RELATED TO OTHER

CAMPUS FACILITIES

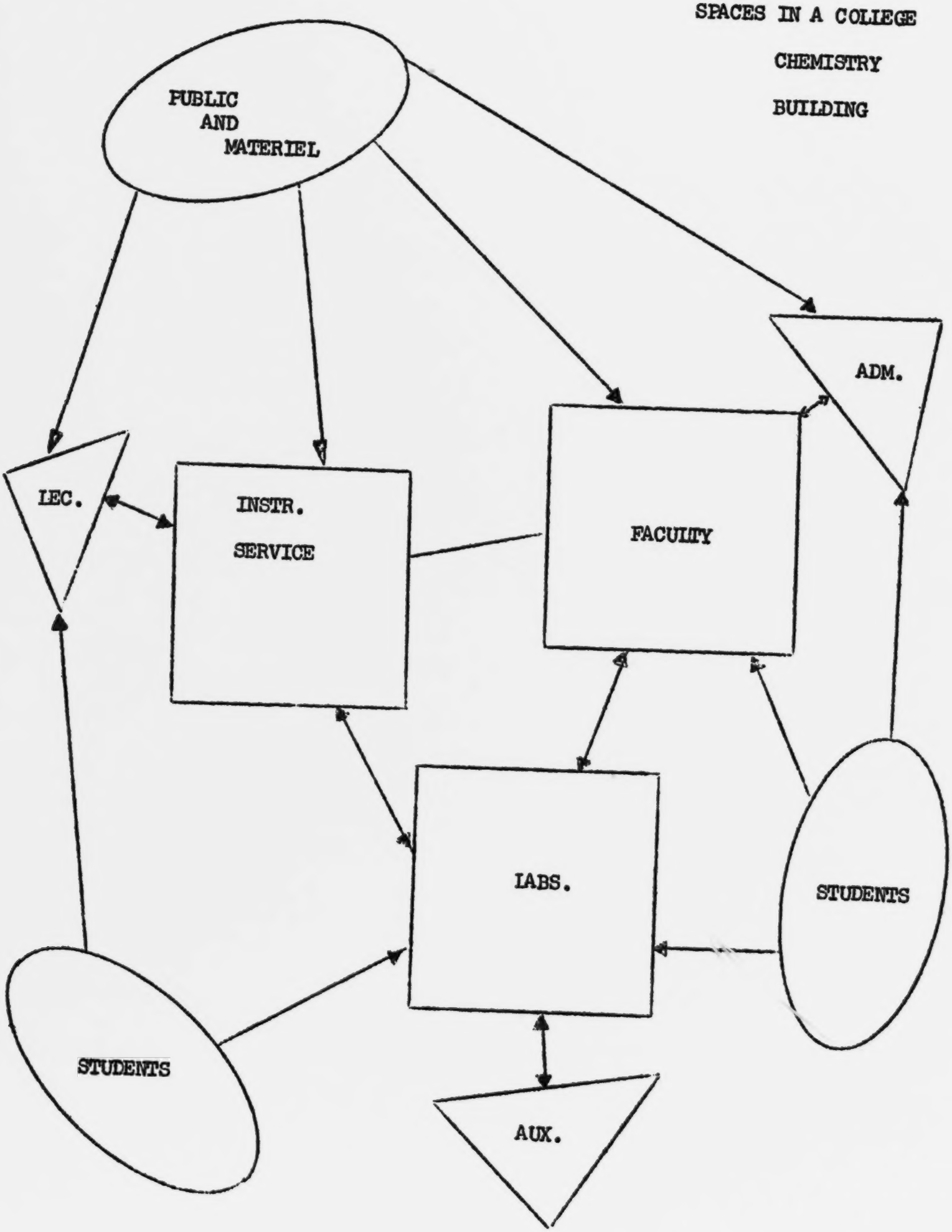


LANGUAGES

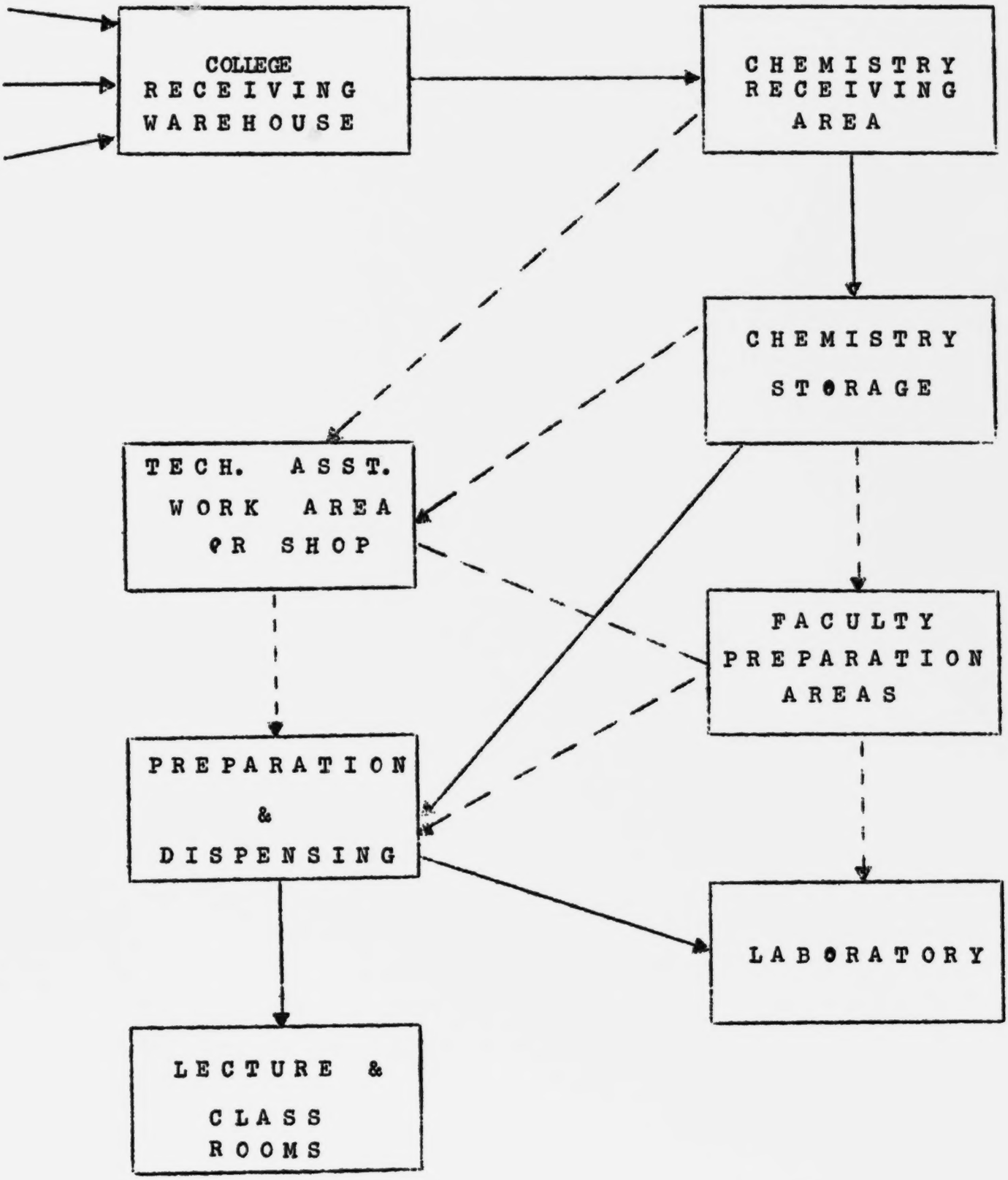
ENGLISH

Appendix B

RELATIONSHIPS AMONG SPACES IN A COLLEGE CHEMISTRY BUILDING



Appendix C



HOW DOES MATERIEL MOVE IN A COLLEGE CHEMISTRY DEPARTMENT?